StarFinder Lite

User's Manual & Reference Guide

Revision 1.3 – 2013

LAIPAC TECH

Federal Communications Commission (*FCC*) Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-Reorient or relocate the receiving antenna.
-Increase the separation between the equipment and receiver.
-Consult the dealer or an experienced installer for help.

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

FCC RF Radiation Exposure Statement:

1. *This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.*
2. *This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment.*
3. *This equipment should be installed and operated with a minimum distance of 20 centimetres between the radiator and your body.*

CE Marking

This device has been tested to and conforms to the regulatory requirements of the European Union and has attained CE Marking. The CE Mark is a conformity marking consisting of the letters "CE". The CE Mark applies to products regulated by certain European health, safety and environmental protection legislation. The CE Mark is obligatory for productions it applies to: the manufacture affixes the marking in order to be allowed to sell his product in the European market.

This product conforms to the essential requirements of the R&TTE directive 1999/5/EC in order to attain CE Marking. A notified body has determined that this device has properly demonstrated that the requirements of the directive have been met and has issued a favorable certificate of expert opinion. As such the device will bear the notified body number 0560 after the CE mark.

The CE Marking is not a quality mark. Foremost, it refers to the safety rather than to the quality of a product. Secondly, CE Marking is mandatory for the product it applies to, whereas most quality markings are voluntary.

Marking: The product shall bear the CE mark, the notified body number(s) as depicted to the right. CE0560.

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Additional regulatory conformance

Specific details about compliance to the following standards and regulatory bodies may be obtained from Laipac Technology Inc.

- PCS Type Certification Review Board (PTCRB)
- Based on Cellular Telecommunications and Internet Association (CTIA) Over the Air (OTA) performance tests
- EN 301 511, EN 300 440, EN 62311, EN 301 489-1-3-7 and 60950-1 testing.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

(1) this device may not cause interference, and
(2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

(1) l'appareil ne doit pas produire de brouillage, et
(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This Class【B】 digital apparatus complies with Canadian ICES-003.

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1 INTRODUCTION

The **Starfinder Lite** is a robust platform designed for remote vehicle tracking and security. It combines both GSM/SMS and GPRS (Global System for Mobile Communications/ Short Messaging Service and General Packet Radio Service) communications with ultra-sensitive GPS technology to provide a rugged yet precise and reliable tracking service. The Starfinder Lite can be used to report positions or events in real-time, as well as log positions for local or remote downloading. The Starfinder Lite comes standard with two optical inputs for connecting to alarm systems or other sensors, one analog inputs, and three output relays for ignition disabling and remote door unlocking. A backup battery is also included.

Each Starfinder Lite can be programmed with a unique device ID and can send data to any static or dynamic IP address or SMS base station. Configuration of the unit can be done locally, via the Starfinder Lite configuration utility in Windows™, or over the air via GPRS or SMS. We currently offer our web-based tracking application **www.LocationNow.com** for tracking and fleet management. For custom applications, we can provide our ADK kit with confidential protocol to software developers for platform integration.

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2 FEATURES

- Worldwide GSM/GPRS Quad band 850/900/1800/1900MHz
- Multi-mode ready for SMS only, GPRS only or SMS + GPRS
- High Sensitivity GPS Receiver of 20 Ch.
- GPS Accuracy 3 – 5 m
- Dimension 9.7 x 5.9 x 2.6 cm
- Built in jacks for SPK and MIC
- Panic button and Dial button ready
- Supply voltage range: 9 to 36VDC
- Internal Li-Ion backup battery able to provide approximately 10h life from a full charge
- Low operating power consumption (less than 1W after battery is charged)
- Both configuration utility and unit are able to have accessing control (option)*
- Operation Temperature -30C to 65C°
- USB Port for configuration
- Compatible with Mobile Data Terminal
- 2 Optically Isolated digital inputs
- 3 Outputs with relays
- 1 Analog input available
- Multiple Geo-Fence capability with in/out fence alert
- Data logger capability built in with 2500 positions memory to record time stamp, speed, location, and event state.
- 3 Axial motion G-Sensor to report impact, accident, crash or towing event.
- Real time dynamic position report based on time interval or distance traveled
- Mileage report and over-speed alert
- Assistance and Emergency call numbers with fail over capability
- Power-saving options available (option)*
- WAAS / EGNOS (optional)*
- 3.7V, 900mAh internal backup battery
- External panic button and call-in answer button

Note:

For features with (option), please check with Laipac Technology Inc to know about their detail.

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3 INITIAL SETUP

This section will help you setup and configure your Starfinder Lite GPS tracking device.

3.1 What you will need

To begin your evaluation, you will need the following:

- Starfinder Lite
- Power and I/O harness cables complete with Voice and Panic buttons
- GSM patch antenna (3 meters cable length)
- GPS magnet mount antenna (5 meters cable length)
- GPRS data enabled SIM card with known APN settings (2G and TDMA compliant)*
- Your Identity Leaflet provided in the Evaluation Kit*
- 9-36V DC power supply
- USB A to USB Mini B cable
- PC with Windows XP™ or later Microsoft Operating System

*GPRS operation assumed

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3.2 Setup Summary

The setup summary is an outline of what must be accomplished in order to operate the device. Detailed descriptions of these steps will be listed in the next sections.

1. Find a computer with Microsoft Windows O.S. and IE 8 supported by Adobe Flash Player 9.0 or above
2. Install the latest version of utility software
3. Complete pre-installation of USB driver on computer
4. Power on Starfinder Lite with DC power supply (12V)
5. Connect the Starfinder Lite to the computer and reset the unit with reset button
6. Install USB driver on computer
7. Run utility and reset unit with reset button
8. If unit is not activated (locked), activate (unlock) it
9. If the existing firmware does not meet the request of utility, update firmware
10. Configure the unit and save the settings to unit
11. Disconnect Starfinder Lite with computer
12. Connect the GPS and GSM antennas
13. Insert the valid SIM card into the SIM Card Tray on the front of the unit
14. Press reset button to valid the configuration and make the device start working

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3.3 Installing the Starfinder Lite Software

3.3.1 Introduction to utility software

"**LocationNow Suite**" is a stand-alone utility software package for all of the major GPS tracking products from Laipac Technology Inc.

User can use the web link below to download its latest version, such as "**LocationNow Suite 20131009**".

http://www.laipac.com/sflite201update.htm

Mainly, "**LocationNow Suite**" is able to provide the two functions below

- Configuration
- Firmware Update

The computer, used for installing this utility, should be with

- Microsoft Windows 7 O.S. (recommended)
- IE8/9/10 browser only, which being supported by Adobe Flash Player V9.0 or up

For Adobe Flash Player V9.0 or up, user has to download it by using Windows IE and the link below rather than downloading it through any other browser.

http://get.adobe.com/flashplayer

3.3.2 Installation of utility software

This software package is a compressed file with suffix ".7z" or ".zip", such as, "**LocationNowSuite20131009.7z**"

Decompress it to get the executable program "**LocationNowSuite20131009.exe**"

Run "**LocationNowSuite20131009.exe**".

Follow "Setup Wizard" instruction, click "Next", step by step, user can complete the installation of this utility software.

3.3.3 Installation of USB driver

Depending on what kind of Microsoft Windows Operating System being used on user's computer, the installation of USB driver procedure is different. User could find all those detail in **Quick Start Manual** version 2.4, section 2.

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3.4 Configuration of StarFinder Lite

3.4.1 Start configuration of your device

Refer to **Quick Start Manual**'s **section 4**, "**How to start configuration of your unit"**

3.4.2 Basic Configuration

To ensure user's unit is able to access remote server, such as Laipac's LocationNow service platform, some basic setting items are requested and described in this section.

a. SETUP → Device Info

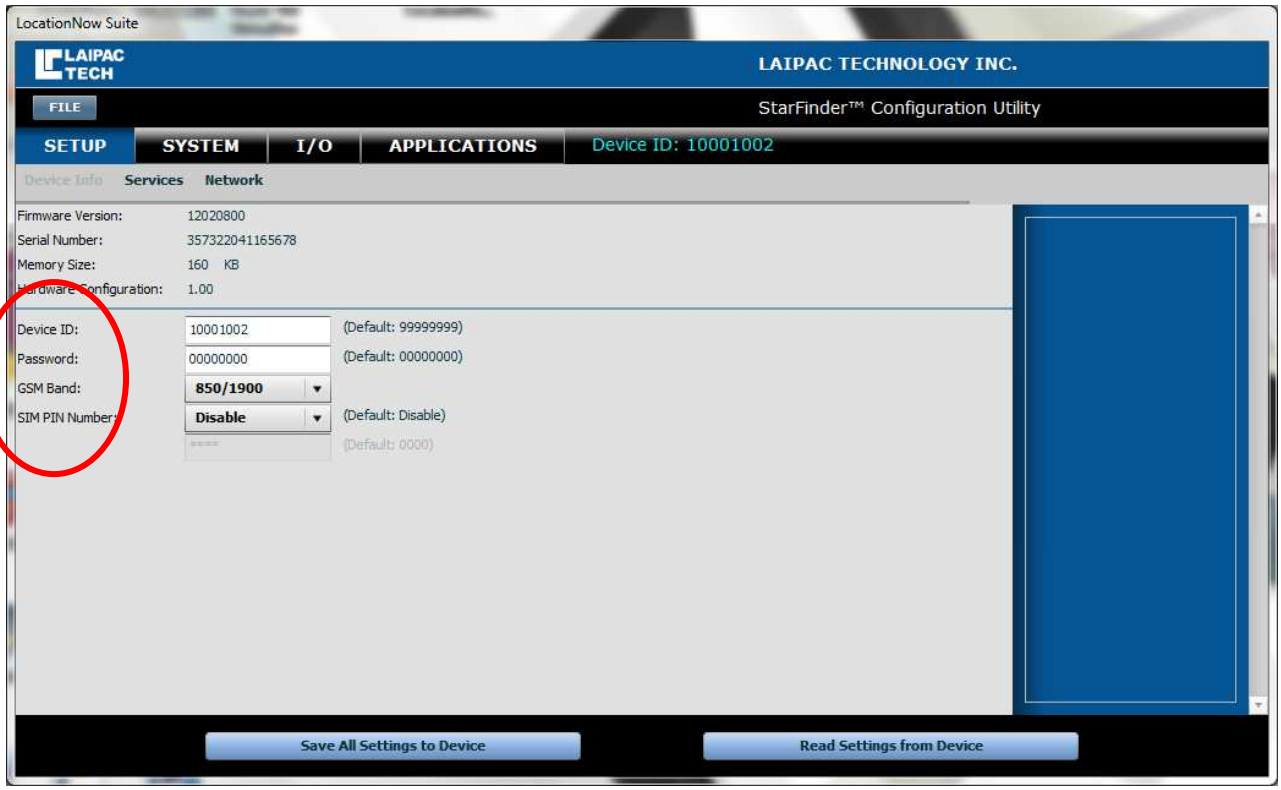

Fig. 3.4.2.a

Device ID: Specific unit identifier that identifies your device for online tracking. You can locate the Device ID on your Identity Leaflet or more accurately in your user account on the website www.LocationNow.com.

Password: Used to protect the StarFinder Lite from other people affecting its operation with SMS commands. You can locate the Password on your Identity Leaflet.

GSM Band: This is for setting a frequency that your GSM provider network operates at. The North American network bands are 850/1900 and the European network bands are 900/1800. If user is not sure what frequency his carrier operates at, please contact them for the correct setting.

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SIM PIN Number: If your SIM card is password protected, enable this option and input the PIN code. The PIN code tells the Starfinder Lite to use the user defined PIN code when communicating with GSM

b. SETUP → Services

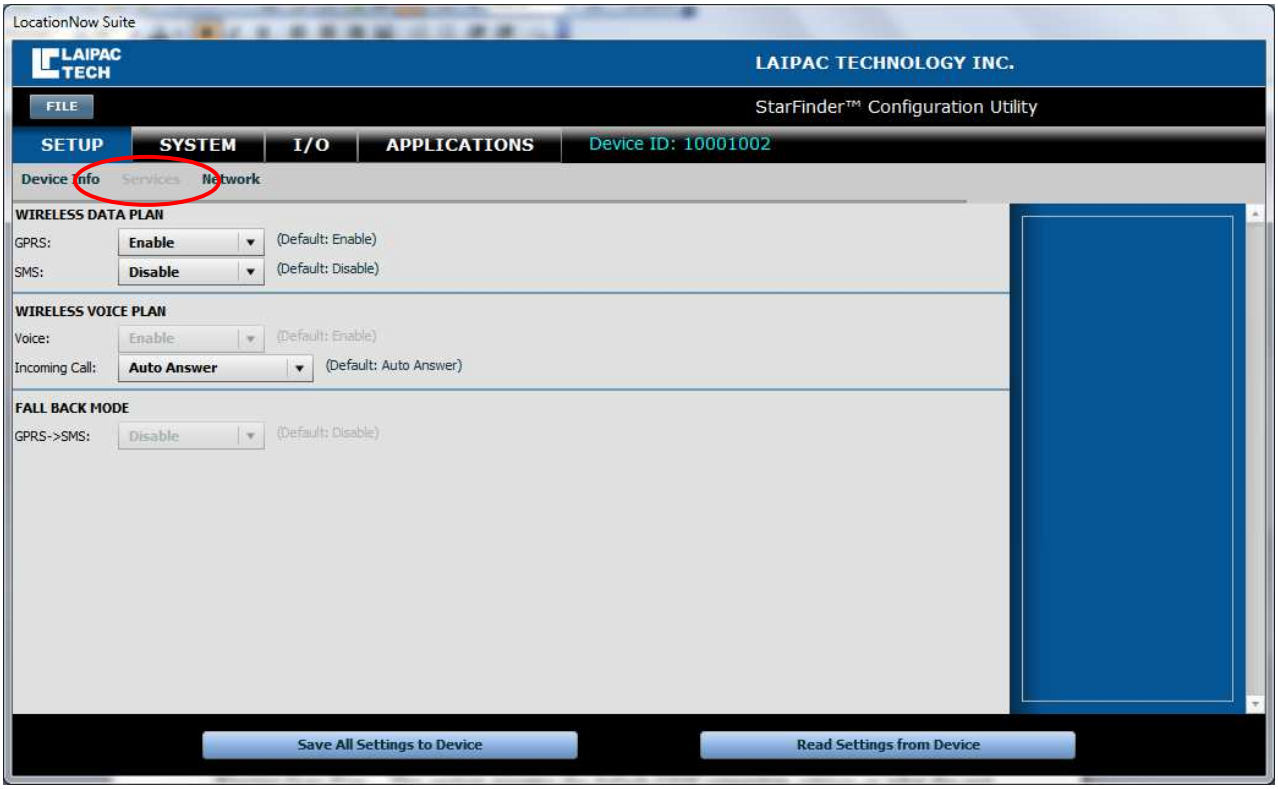

Fig. 3.4.2.b

Wireless Data Plan This section governs the default GSM connection settings or what the unit will connect to first.

GPRS: If you are using LocationNow tracking services, this must be enabled. GPRS mode tells the device it will be transmitting its information across the internet.

SMS: If you are tracking service based on Short Message System rather than LocationNow, SMS mode should be enabled. It tells the device to transmit its information to another SMS device.

Wireless Voice Plan This section initializes the voice option in the StarFinder Lite

Voice: Originally, this setting is designed to tell unit if the existing SIM card is with voice calling enabled. Currently, unit has enabled this setting actively. Of course, i**f you are using SIM card without Voice Plan, no calling or voice communication can be accomplished.**

Incoming Call: This setting determines whether or not the unit will automatically answer incoming calls. As prerequisite, **Voice** must be enabled first.

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Fall Back Mode This section is used to decide how the unit will react in the event there is no GSM coverage.

GPRS -> SMS: In the event of GPRS communication is lost, the unit will automatically switch to SMS mode. While GPRS becomes reacquired, the unit will automatically switch back to GPRS mode of operation.

Note:

1. If user is operating his device exclusively in SMS mode, he may skip this step.

2. In the event that GPRS fails and SMS 'Fall Back Mode' has been set, unit will immediately try its SMS connectivity. If there is no SMS connectivity, the unit will keep switching between SMS and GPRS until the unit synchronizes with one of these 2 modes. It is noted that GPRS takes priority if both SMS and GPRS connection exist.

c. SETUP → Network

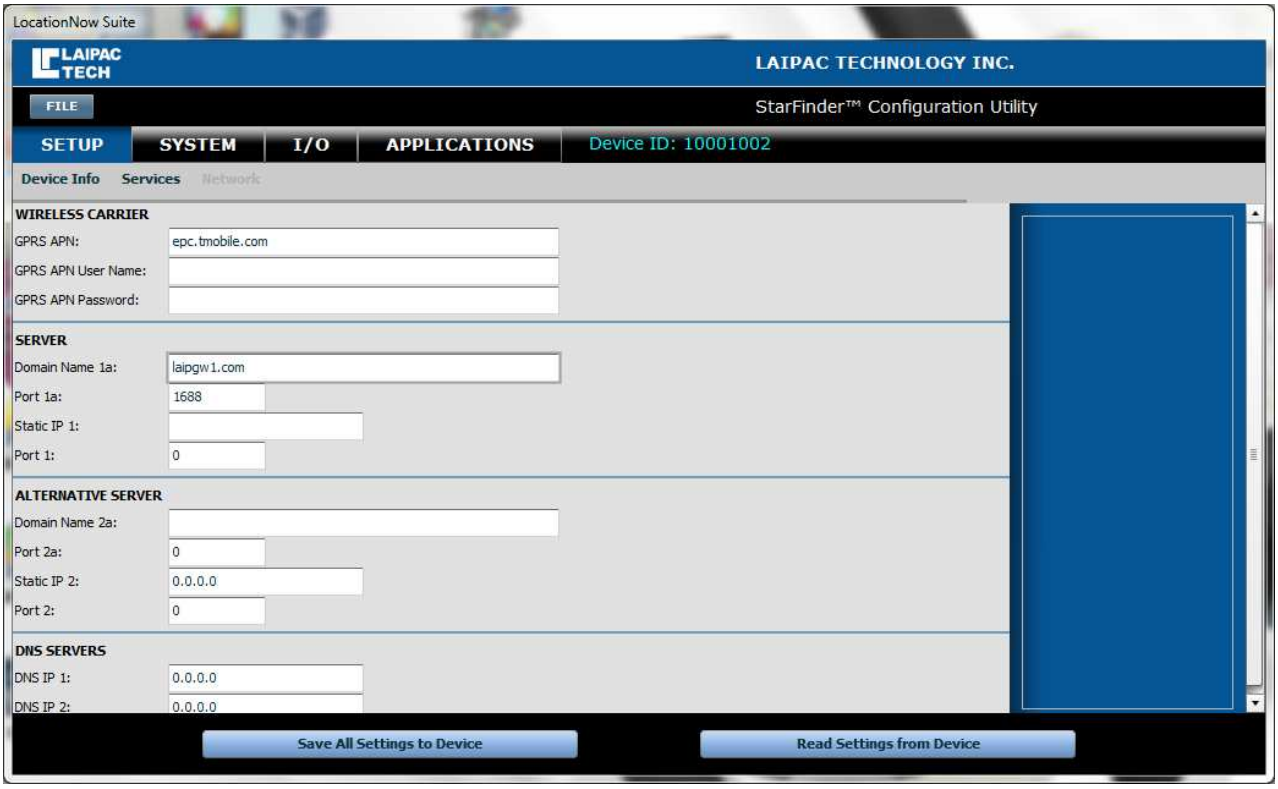

Fig. 3.4.2.c

Wireless Carrier This section covers the information required by the unit to access your carrier's Access Point.

GPRS APN: The Access Point Name is used by your SIM card to connect to the GPRS network. The Access Point is the carrier's server through which the traffic becomes converted from GSM to GPRS Internet traffic. Check with your SIM Card provider for this item.

User Name: The user name authorises your SIM card to access your carrier's Access Point. It could be blank in most of case.

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Password: The password authenticates your SIM card to access your carrier's Access Point. It could be blank in most of case.

Server This section governs the destination end point for the GPRS traffic

Domain Name 1a: This is the domain name of the remote server. For www.LocationNow.com, it will be **'laipgw1.com'**.

Port 1a: This is the Port used by the remote server with **Domain Name 1a.** For www.LocationNow.com , it should be **'1688'**.

Note:
As a rule, if both **Domain Name 1a** and **Static IP 1a** are set, unit will try to communicate with remote server through the domain name first, IP address second. If both **Domain Name 1a** and **Static IP 1a** are inaccessible for any reason, then, unit will turn to try its back-up server, Alternative Server, if it exists. Unit will try domain name of Alternative Server first, IP address second.

It is suggested that user does not fill in **Domain Name 1a** and **Domain Name 2a** with Static IP address**.**

Warning:
If unit has a '***Fall Back Mode***' setting, along with Primary Server and Alternative Server, when it loses its GPRS connectivity with its remote servers, both Primary and Alternative Server, unit will initiate its action of '***Fall Back Mode***'. Refer to introduction to ***Fall Back Mode***.

ALTERNATIVE SERVER

Configuration of the Alternative Server is optional.

Alternative Server is a backup server and used when the primary server is not unavailable. For its configuration parameters, **Domain Name 2a** and **Port 2a,** as well as **Static IP 2 and Port 2,** please refer to introduction to *Server***.**

DNS SERVER

DNS IP 1 and **2**: Allows you to specify DNS servers by using the IP address. Since unit's internal GSM module does this already, these settings are optional.

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d. System → Report

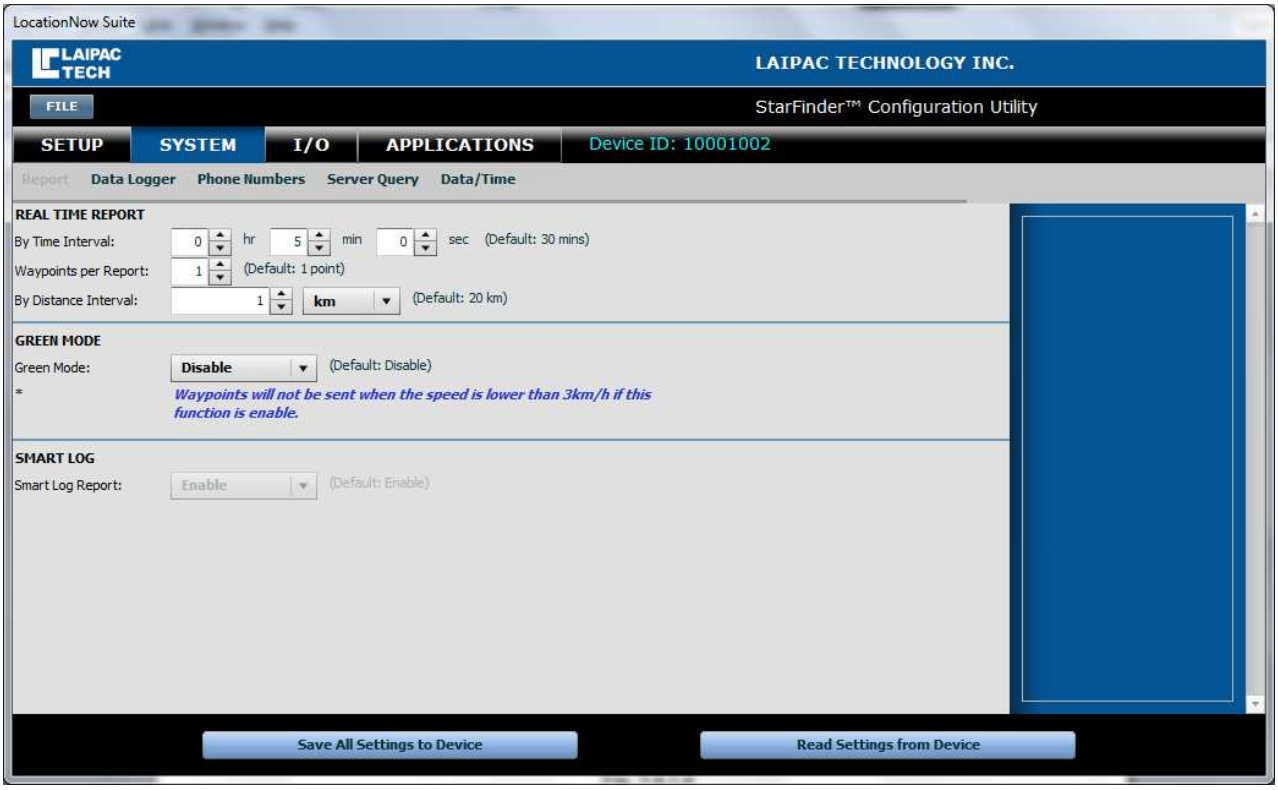

Fig. 3.4.2.d

Report and its setting:

This option allows you to specify how frequent the unit will send a position update. You can specify the report by time value in hours, minutes, and seconds. Also, user can specify the report by distance value in kilometres, miles, or yards.

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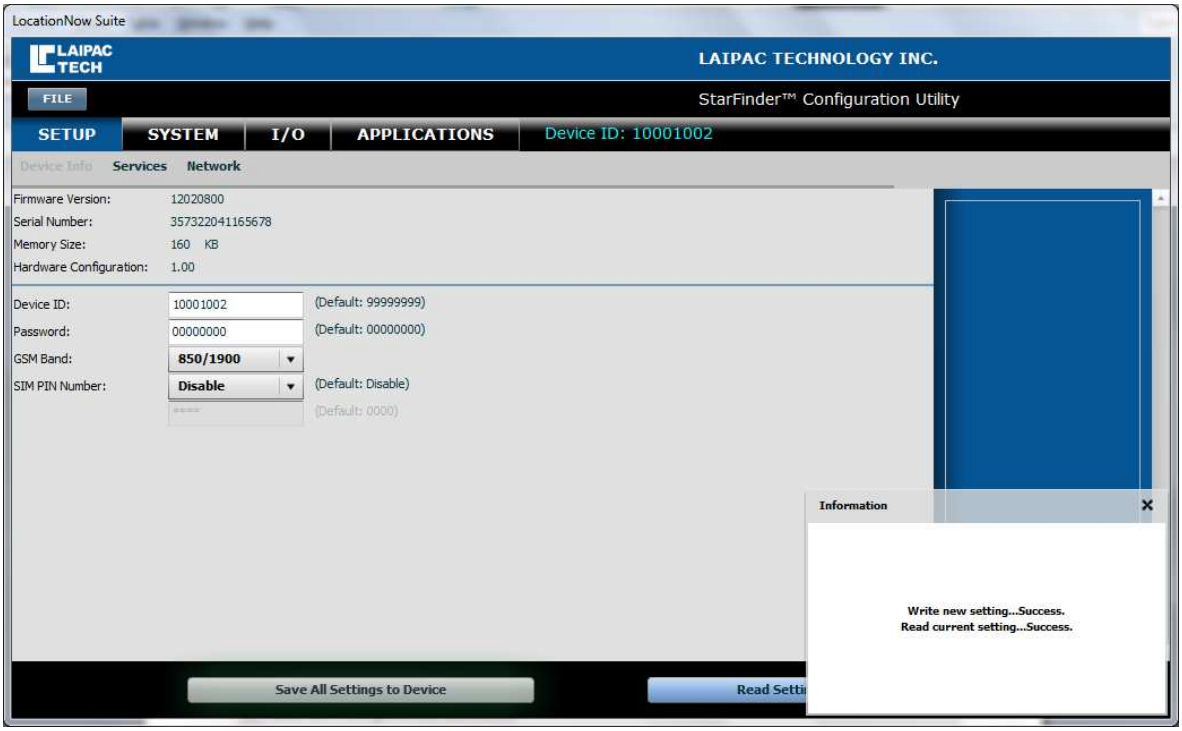
3.4.3 Save setting into or read setting from the device



Save setting into unit and valid it

Once user complete the configuration, he should click "Save All Setting to Device" button to save the edited setting into unit if this saving process is OK, Operator should see the pop up window with prompt "Writing new setting … Success".

To valid this configuration, user needs

- Disconnect computer with unit
- Insert a valid SIM card into unit and power up the unit with DC power supply (12V)
- Reset unit with reset button to start running application

Read the setting from units

By clicking "Read Setting from Device" button, user can read the reside configuration from the unit, which being connected to the running utility.

If unit has never been configured and valid its configuration, this reading configuration operation will be failure.

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3.4.4 Acquire setting from or save setting into a configuration file

Acquire setting from a existing configuration file

User can acquire a set of configuration from a saved configuration file on his computer

a. Click "FILE" → "Import file", see Fig. 3.4.4a and 3.4.4b

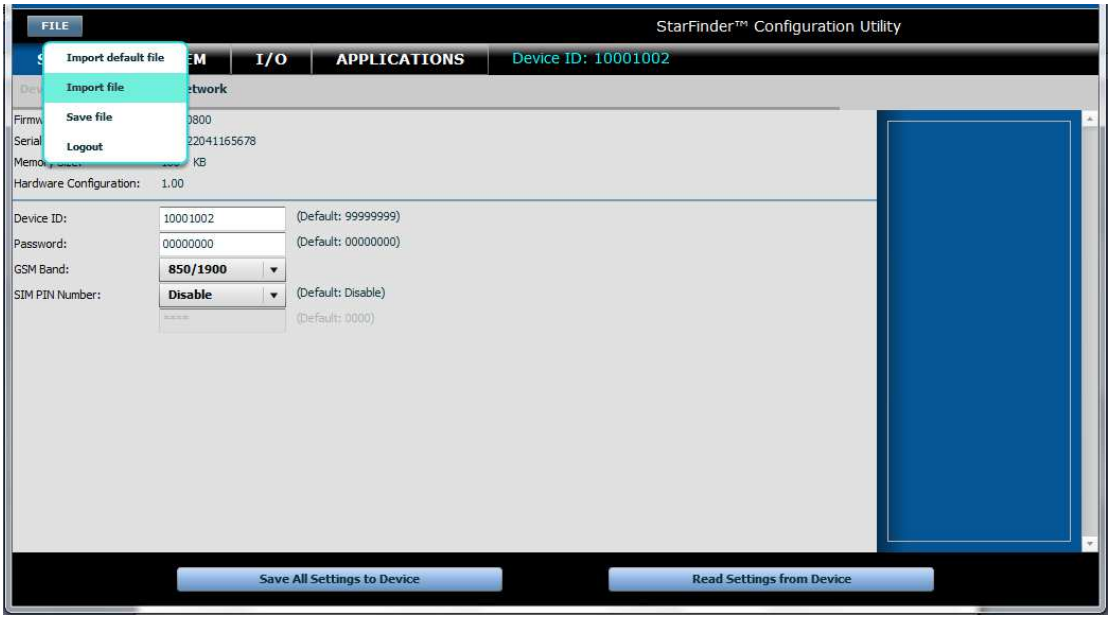

Fig. 3.4.4a

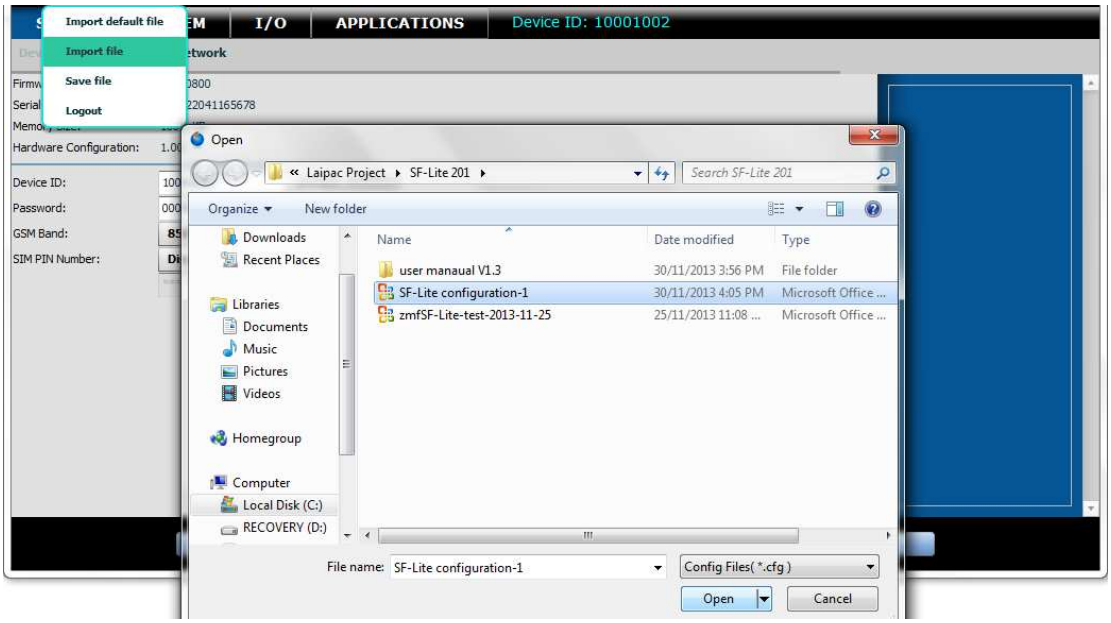

Fig. 3.4.4b

b. From the existing files to select a prefer one, such as, "**SF-Lite configurati-1"**, then click "Open" If reading file is successful, user can see a pop-up window with prompt "Success".

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Save the current configuration into a configuration file

User can save the current edited configuration into to a configuration file follow the steps below

c. Click "FILE" → "Save", see Fig. 3.4.4c and Fig. 3.4.4d

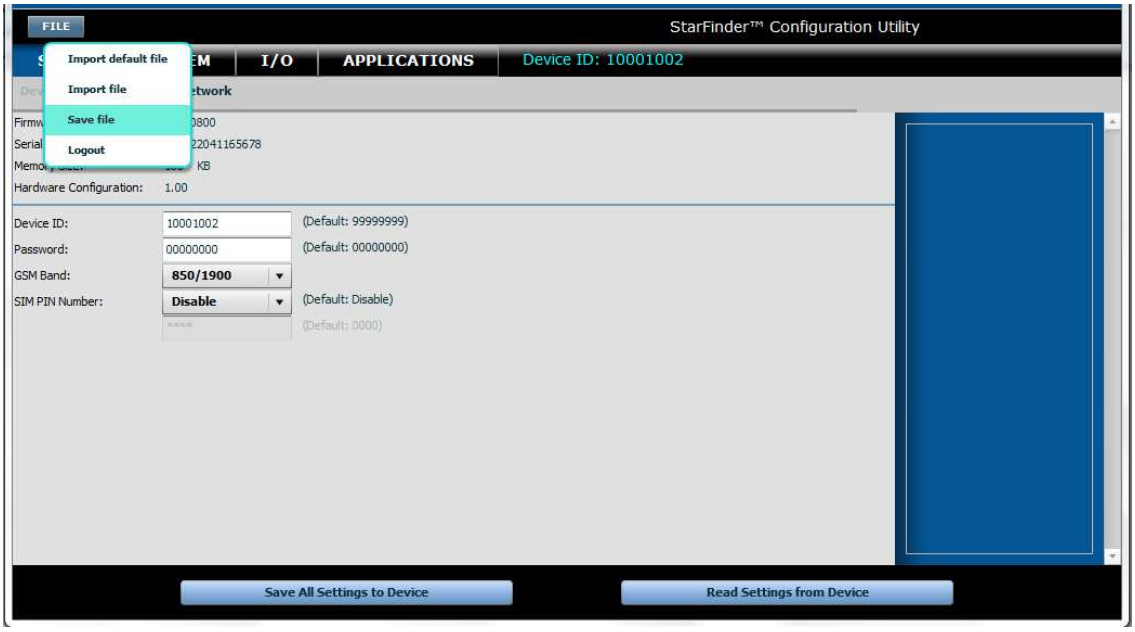

Fig. 3.4.4c

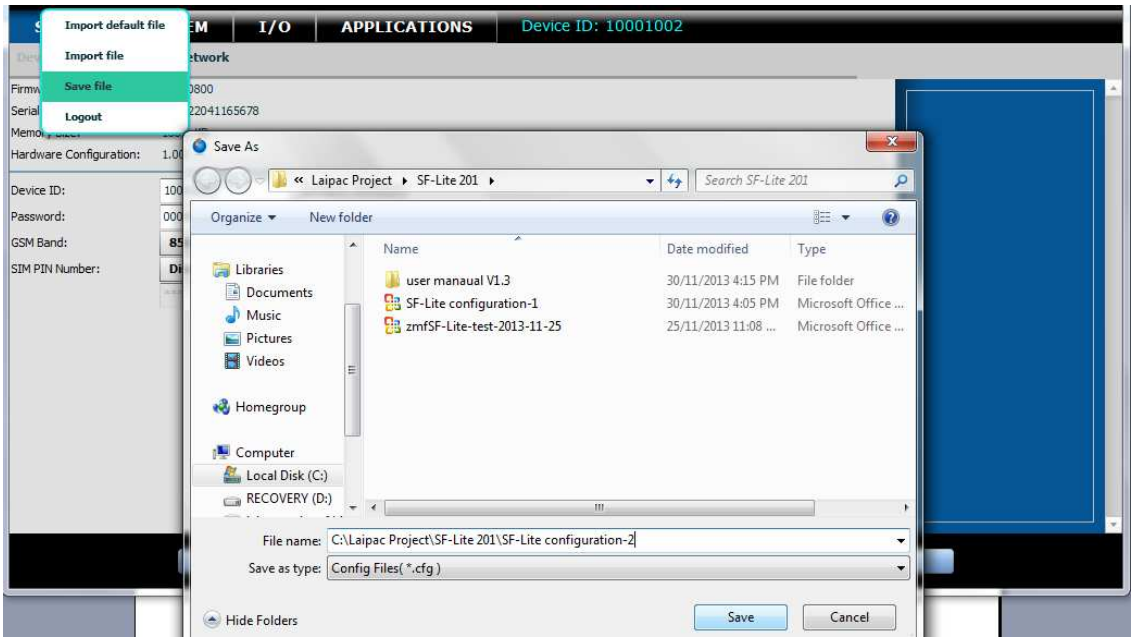

Fig. 3.4.4d

d. User should type in the name of this new configuration file, such as, "**configuration-2**", then, click "Save".

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4. Advanced Configuration and Features

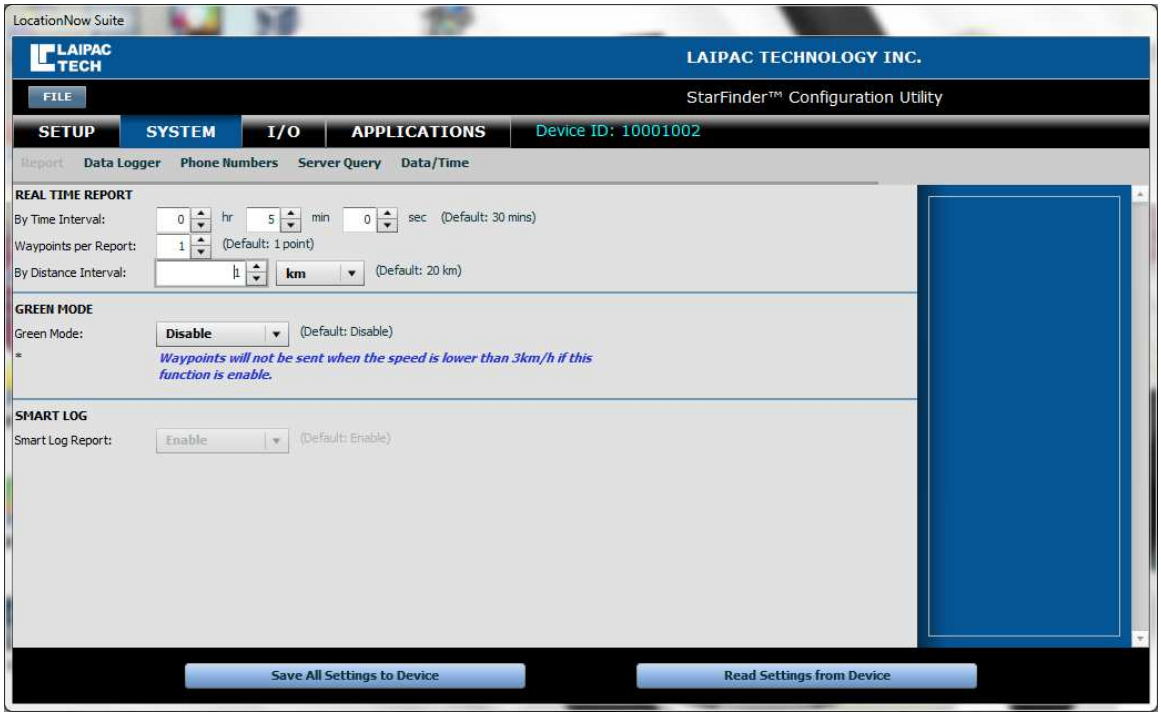
This section introduces all other configuration settings not covered by section 3.4.2 **Basic Configuration. Those settings can be** categorized into 4 major parts: SETUP, SYSTEM, I/O, and APPLICATION. Among them, **SYSTEM** settings are concerned with reporting and voice setup. **I/O** settings are used for customizable I/O functionality. The **APPLICATION** settings are used for other types of event messages.

4.1 Setup Setting

Refer to section 3.4.2, a to c

4.2 System Setting

SYSTEM → Report



Report and its setting: This option allows you to specify how frequent the unit will send a position update. You can specify the report by time value in hours, minutes, and seconds. You can specify the report by distance value in kilometers, miles, or yards.

Waypoints per Report: This is a user defined value used for report bursting and is governed by report by time. An example is if the number of waypoints per report is set to 5 and the report by time interval is set to 1 minute, in 5 minutes, the receiving server will receive 5 waypoints.

Smart Log Report: The smart log report option allows the unit to automatically log its position and alert information into internal memory in the event there is no GPRS connectivity. When the Starfinder Lite reconnects to GPRS, the saved messages will be sent to remote server actively. **Automatically, this function has been always enabled by unit. User can skip this setting**

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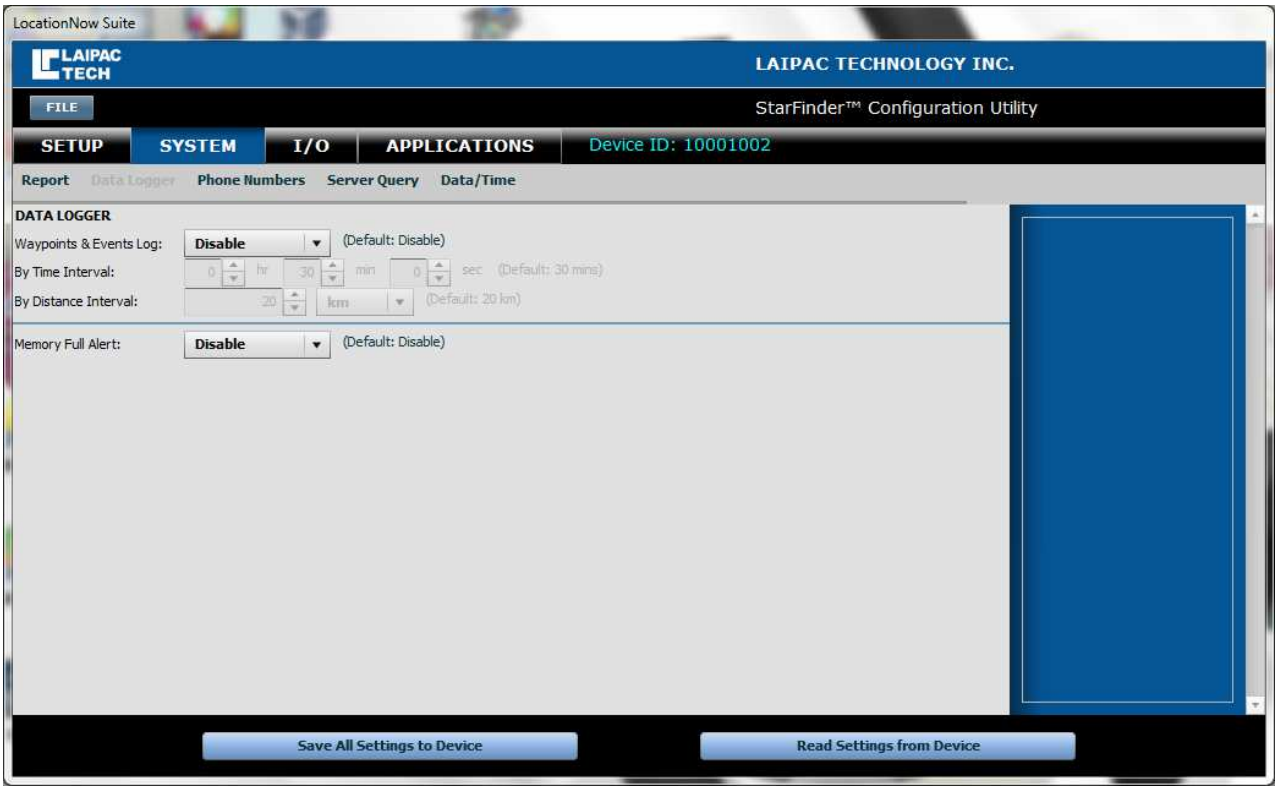
SYSTEM → Data Logger



Waypoint Log: Waypoints & Events Log setting gives you the option to log or store waypoint and alert messages in the unit's internal memory.

By Time Interval: Logs messages into internal memory based on the specified time interval.

By Distance Interval: Logs messages into internal memory based on the specified distance interval.

Memory Full Alert: Data Logger Memory Full alert will cause the unit to send an alert when the internal memory of the unit is full. This means that once the unit runs out of memory, an alert will be sent to the GPRS server

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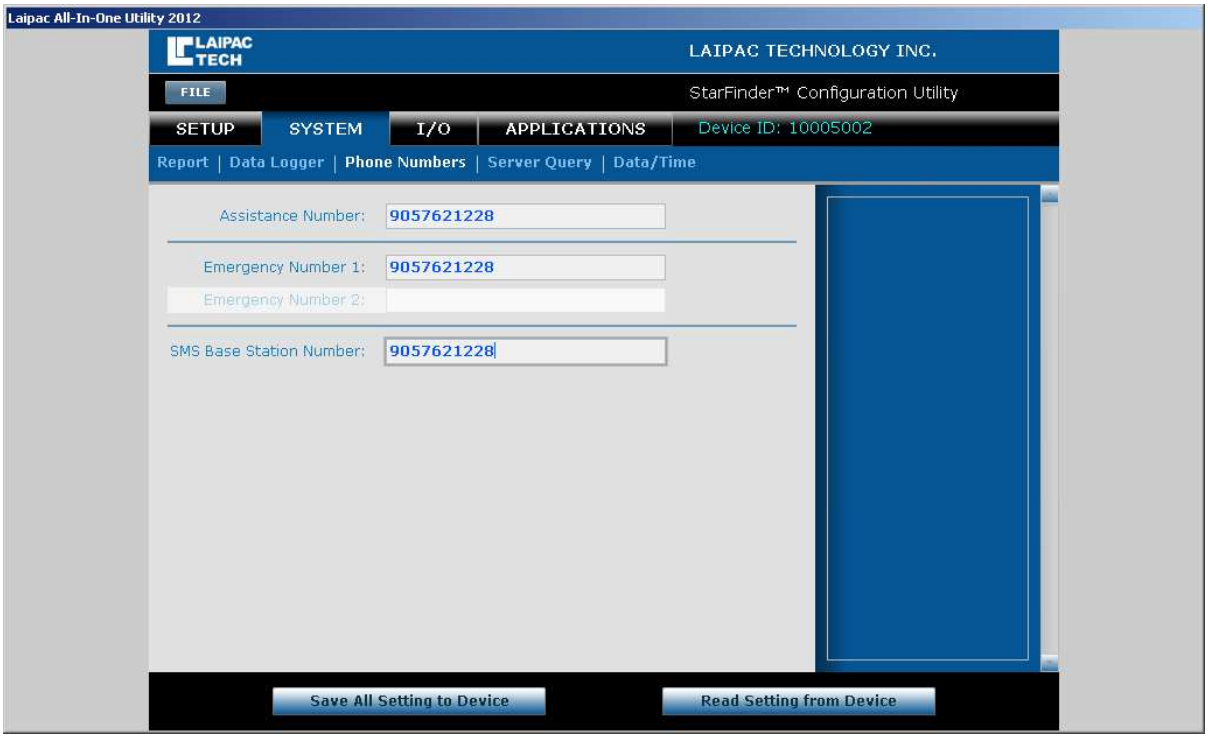
SYSTEM → Phone Number



Assistance Number: When user presses the Panic button on 10-pin I/O cable, the number programmed into the "Assistance Number" field will be dialled.

Emergency No 1: If this number is set up and unit will send SMS message to the SMS device with this No. under conditions below

a. User presses the Panic button on 10-pin I/O cable, or
b. Unit is triggered by Towing Alert or Accident Alert
c. Emergency No. 1 sending function related to these alerts are enabled.

SMS Base Station: The SMS Base Station Number is used when the Starfinder Lite is operating under SMS mode. All of the waypoints and alert messages will be sent to the SMS Base Station Number. This number also can belong to a cell phone, an SMS modem, or any SMS device. Once this No. is set up, device only accept the command sent by SMS device with this No.

Note:

To use the Assistance Number for doing phone call, user's SIM card must be with valid Voice Plan

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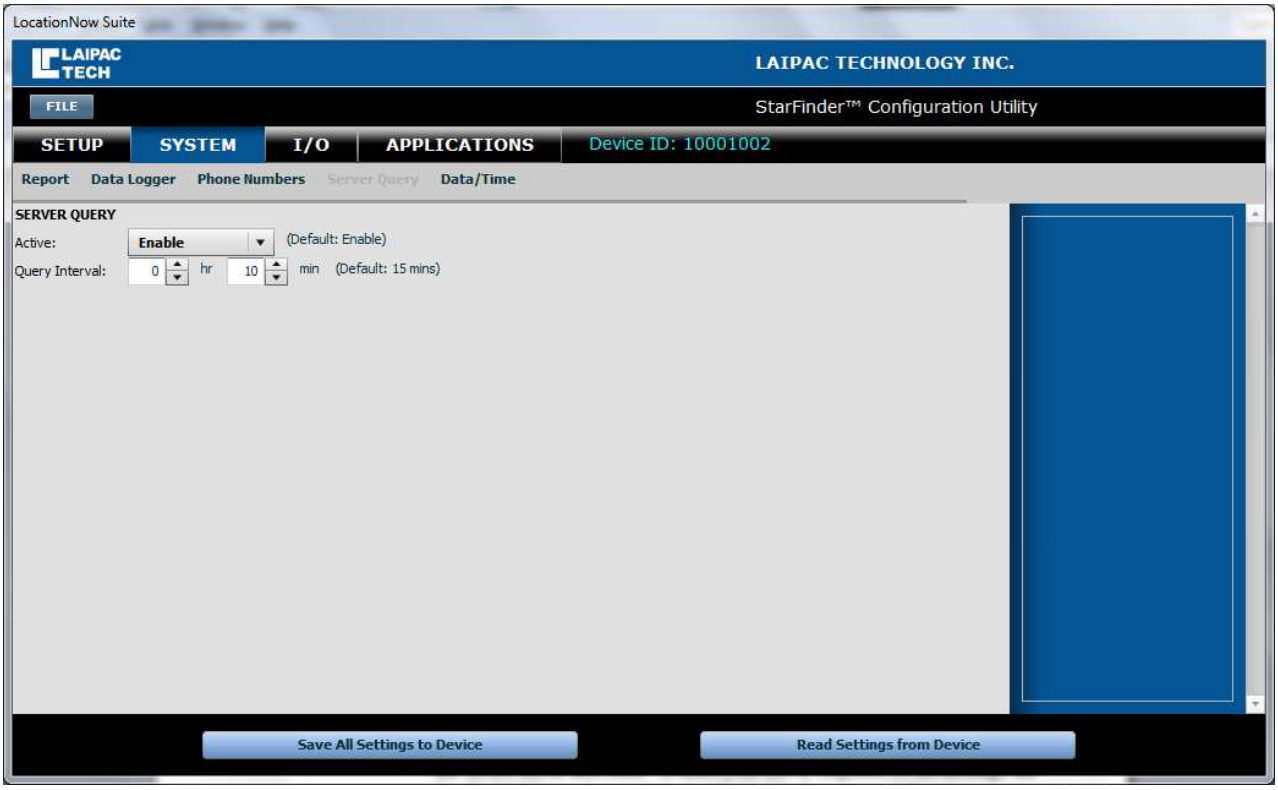
SYSTEM → Server Query



Server Query: Used as a GSM keep alive and tests the connection status of the Starfinder Lite. This setting must be enabled first.

Query Interval: The time interval in which the Starfinder Lite tests the GPRS and TCP/IP connection between the server and itself. If server does not respond to the connection-checking message sent out by Starfinder Lite, the unit will enter into re-develop connection process.

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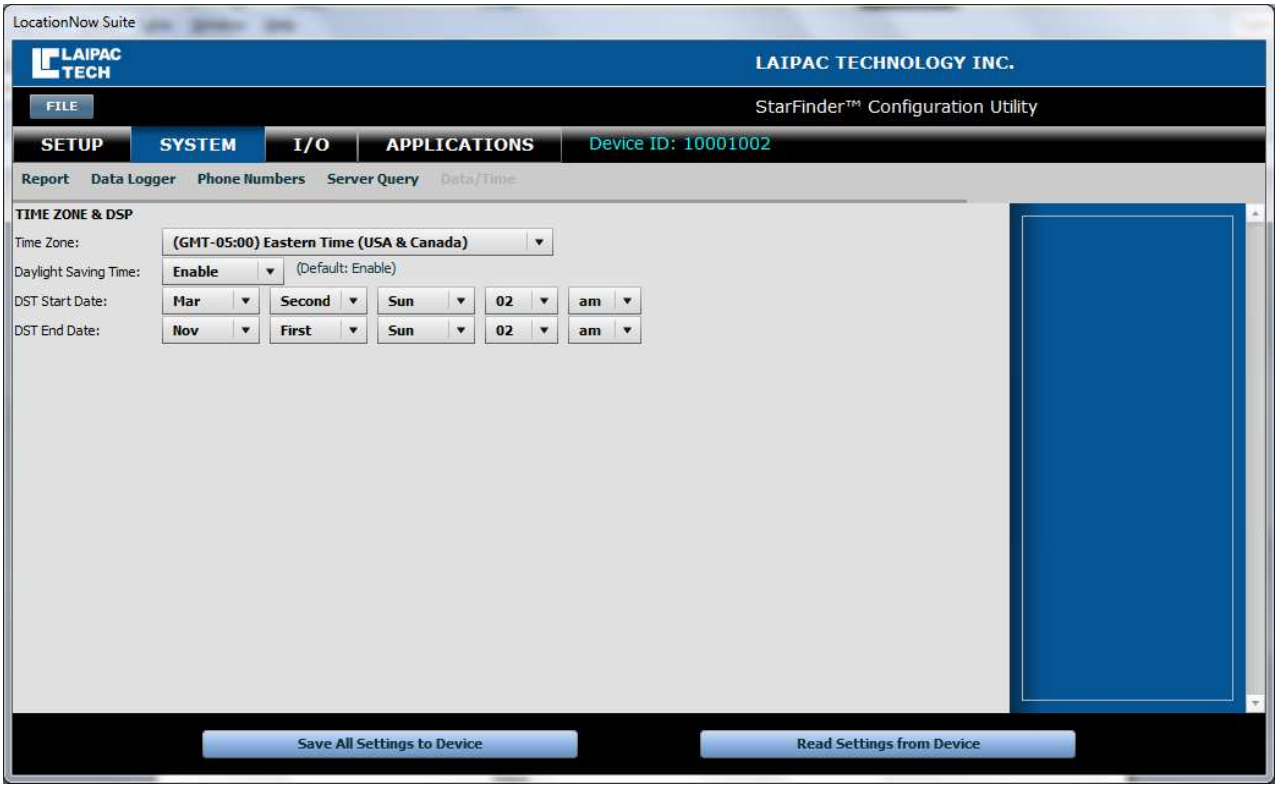
SYSTEM → Data/Time



Time Zone: Use this to select your time zone so that the device knows your local time.

Daylight Savings Time: Use this to enable the daylight savings time start and end dates.

DST Start Date: This is a user defined value of when the user starts their daylight savings time.

DST End Date: This is a user defined value of when the user ends their daylight savings time.

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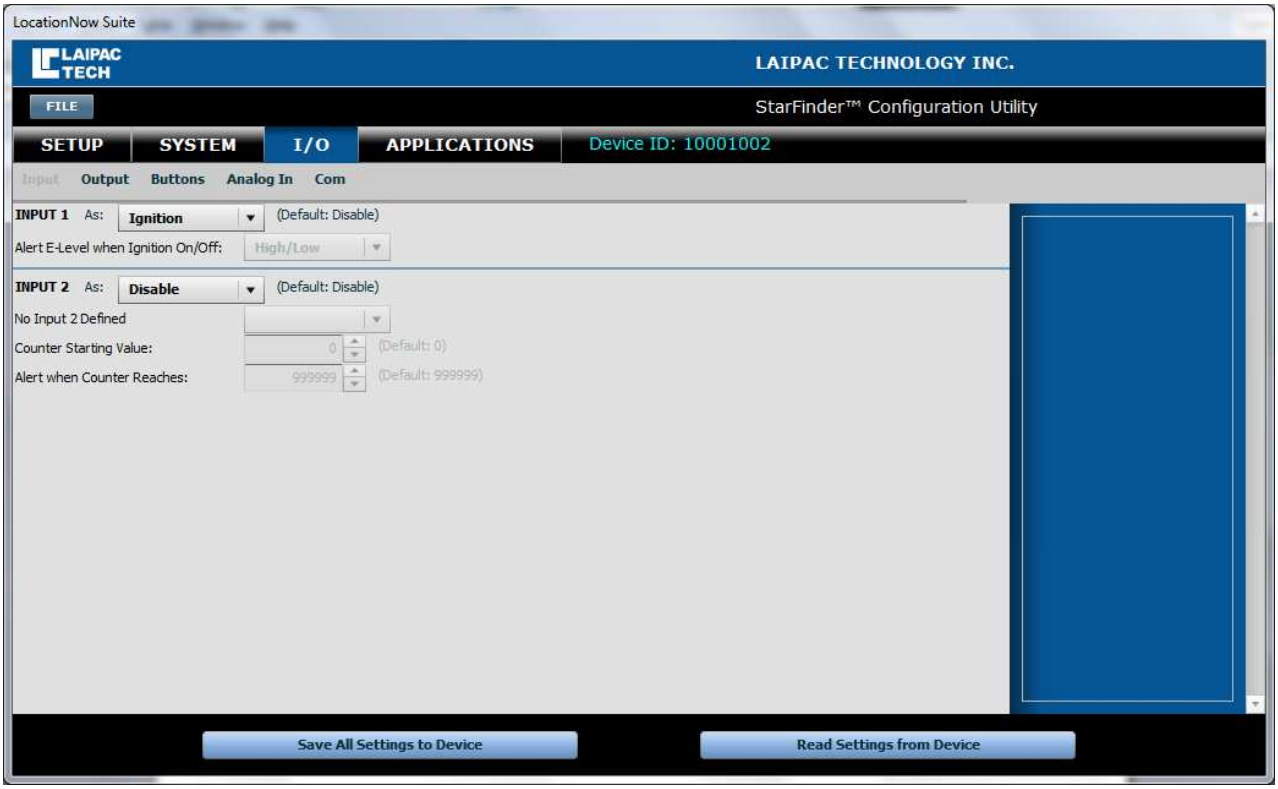
4.3 Input/Output Settings

I/O → Input

Input setting items allows you to activate and select the functionality related to input. Input 1 has options "Disable" and "Ignition". Input 2 has options "Disable", "Trigger", and "Counter".



Trigger setting: This option allows you to send an alert when the alert signal condition is met on an Input. An alert is generated when the voltage level goes from either a High to a Low or from a Low to a High. This setting is user defined.

Counter setting: This option allows the user to implement input 2 as a counter. The counting signal can be specified as either a Low to High (Low →High) or a High to Low (High→Low) voltage level change. The maximum counting speed is 50 times per second, with minimum voltage change of last at least 10 ms.

Counter Start Value: This option allows the device to record how many times the alert gets triggered and accumulates from the value you set it to.

Counter Alert Value: This option allows you to tell the Starfinder Lite to send an alert when the counter value reaches a user defined value. If you set it to 90, it will send an alert once the counter's value reaches 90.

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Note:

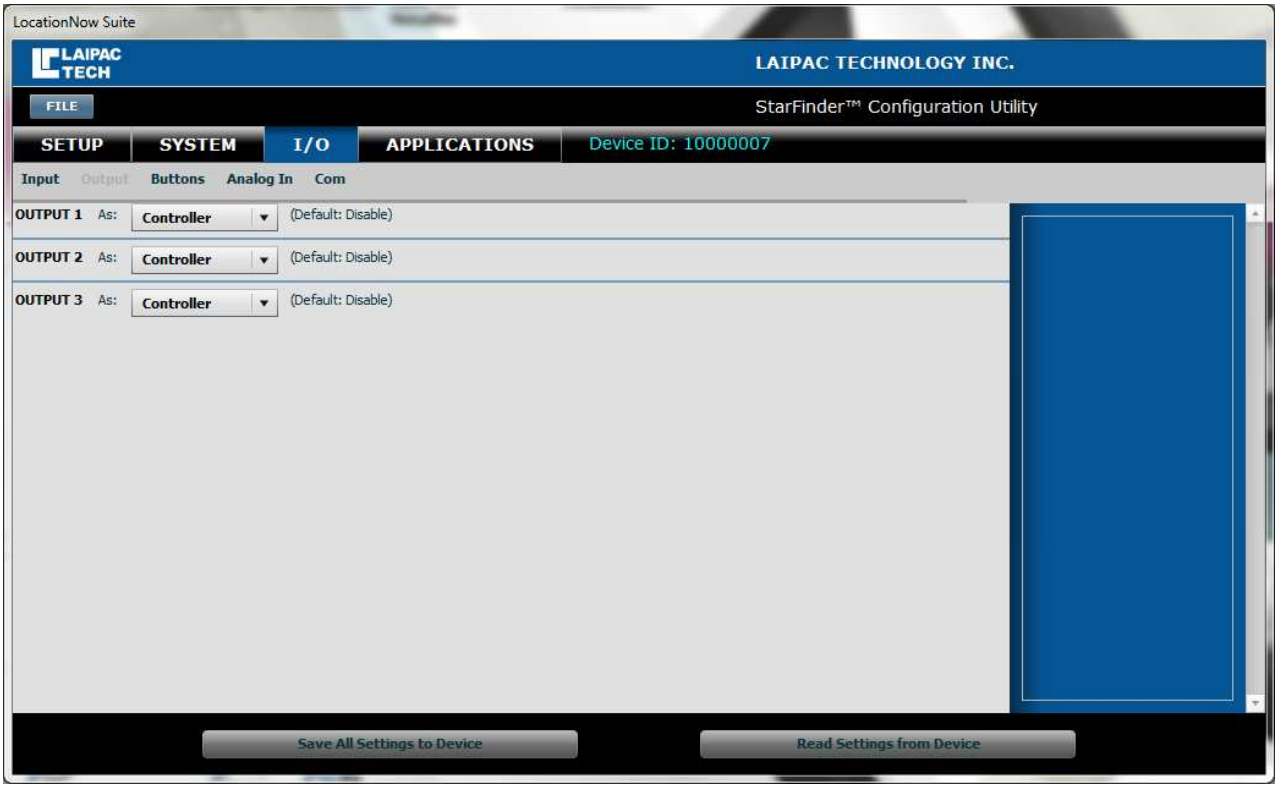
Input 1 has been reserved for detecting the trigger signal corresponding to vehicle's ignition on/off status. Input 1 needs to be enabled if either "Accident alert" or "Towering alert" functions to be available. The trigger signal exerted on Input 1 should meet the following requests

1. Before starting engine, its input voltage is Logic Low
2. After starting engine, it keeps input voltage is Logic High
3. When engine shuts down, its input voltage is back to Logic Low

For definition of Logic level as its correspondent electrical characteristics, refer to section 5.2.8

I/O → Output

Output setting items allow user to activate and select the functionality related to output. All three outputs are driven by individual internal relays and are wired as "Normally Open". For the "electrical characteristics" of the relays please locate the "electrical characteristics" chart located on page 43.



Controller: The "Controller" option is used to enable the functionality of an output. Each of the 3 outputs is responsible for a different function. The table below outlines those functions, which being with firmware **V1.34 and up**

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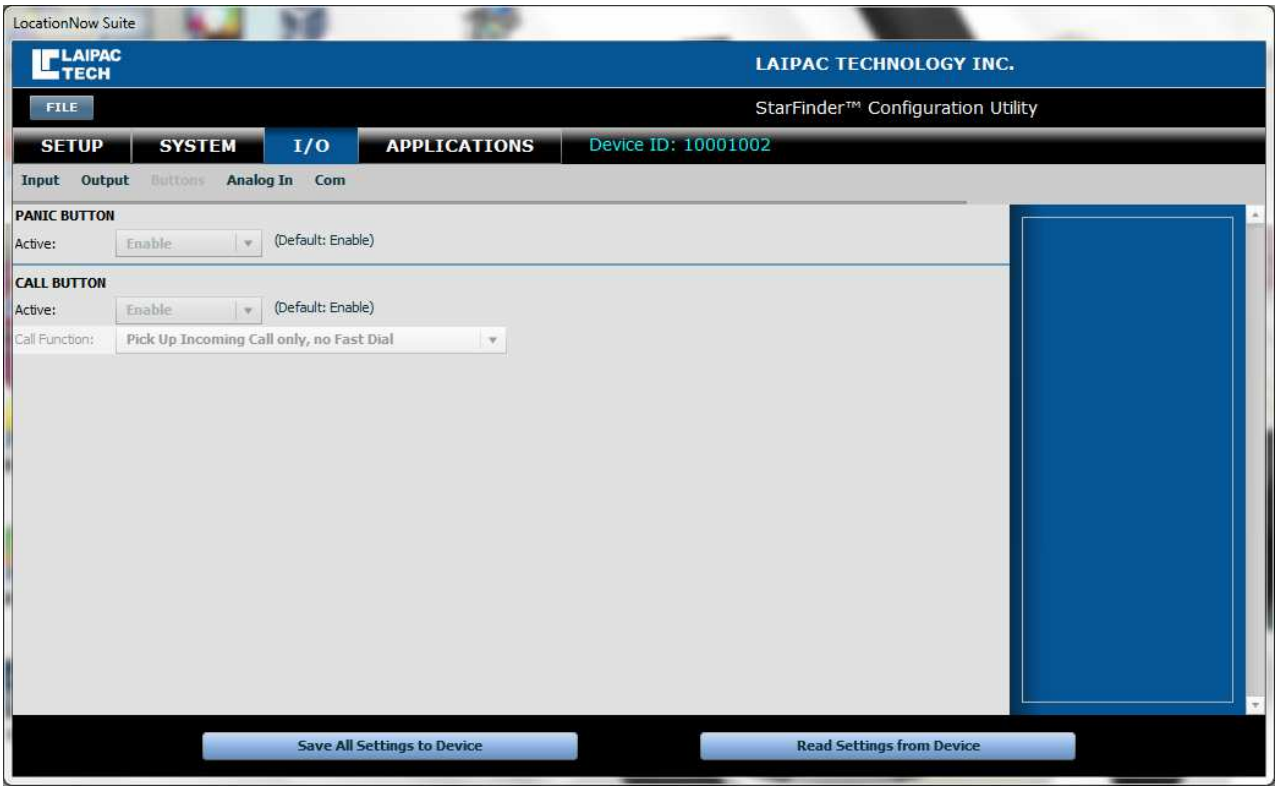
Output	Switch Type	Relay Action	Action times	"on" time (s)	"off" time (s)	Command Type
3	Timed	off→on→off	1	1	Stay as "off"	Send switch Relay "off" Command.
2	Fixed	off → on or on→ off	1	Stay as "on"	Stay as "off"	Send switch Relay "on" or "off" commands.
1	Timed	Off→on→off --- off→on→off	12	1	1	Send switch Relay "off" command.

Note:

a. "on" or "off" command is sent by remote server to control the behavior of those internal relays. For customer who wants to use his own server, he needs purchase the protocol from Laipac.
b. As typical vehicle application examples, with proper external relays, user may use Output3 to control door-open, Output2 for ignition on/off control and Output1 for driving a horn.
c. Depending on actual application request, the output control may have different mode, user should check SF-Lite Application Firmware Release Note to know about what kind of output control mode is being used by the application firmware he selects.

I/O → Buttons



Panic Button: Allows user to activate the functionality of the panic button by enabling it. Once enabled, after pressing panic button, unit will initiate the actions below sequentially

- Send a panic alert message through GPRS connection to the remote server
- Send a SMS message to the SMS device with Emergency No. 1
- Initiate a phone call by dialing Assistance Number

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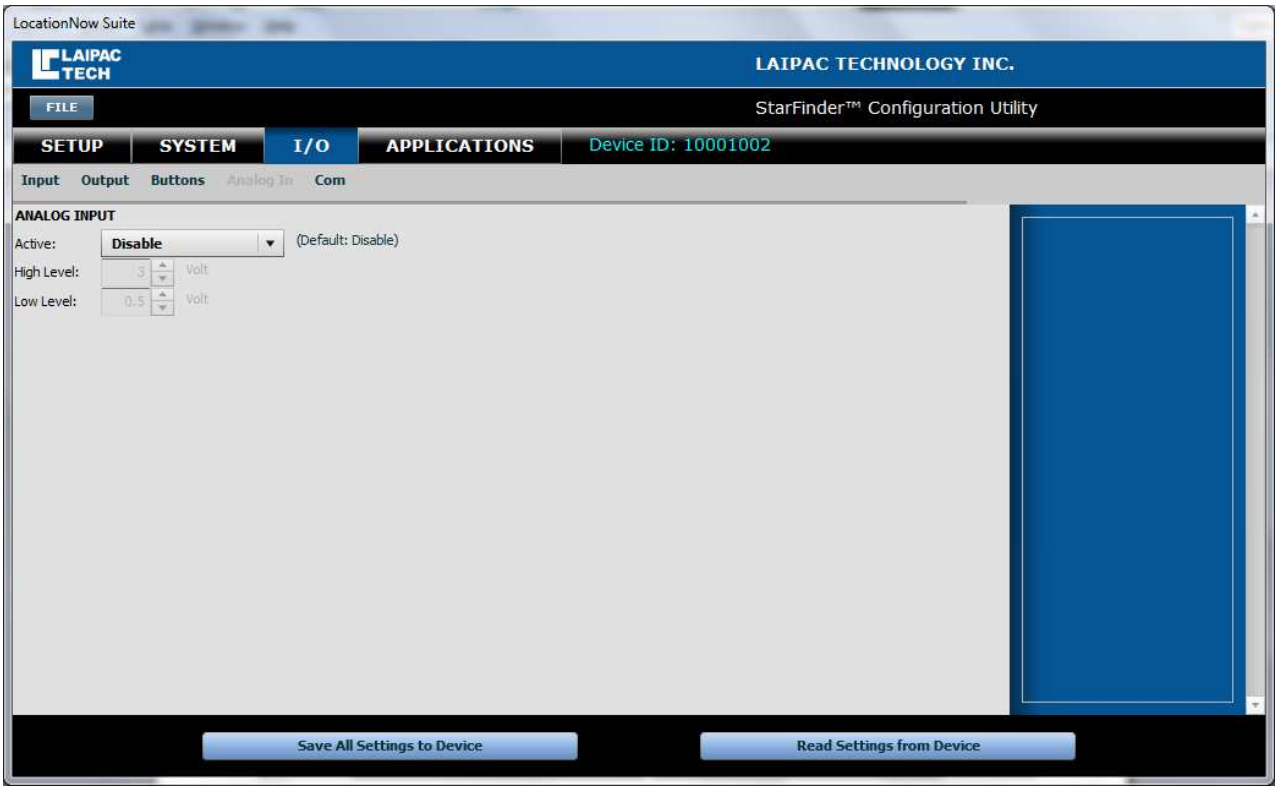
Call Button: Allows you to activate the functionality of the call button by enabling it. Once enabled, it will allow the user to select
- Auto Answer the incoming call, or
- Press this button to pick up the phone call

Note:

For unit with application firmware V1.34 and up, automatically, both of these 2 buttons have been enabled by unit. User can skip this setting

I/O → Analog In



Analog Input: It is designed to detect input voltage, which ranging between 0.00 and 3.30 volts. The threshold of voltage value can be specified through a pull-down list. As default, it is set as Disable

• Alert High – if input voltage value is higher than High Level setting, device will send out a alert report to server to remind of server an Alert High event occurs

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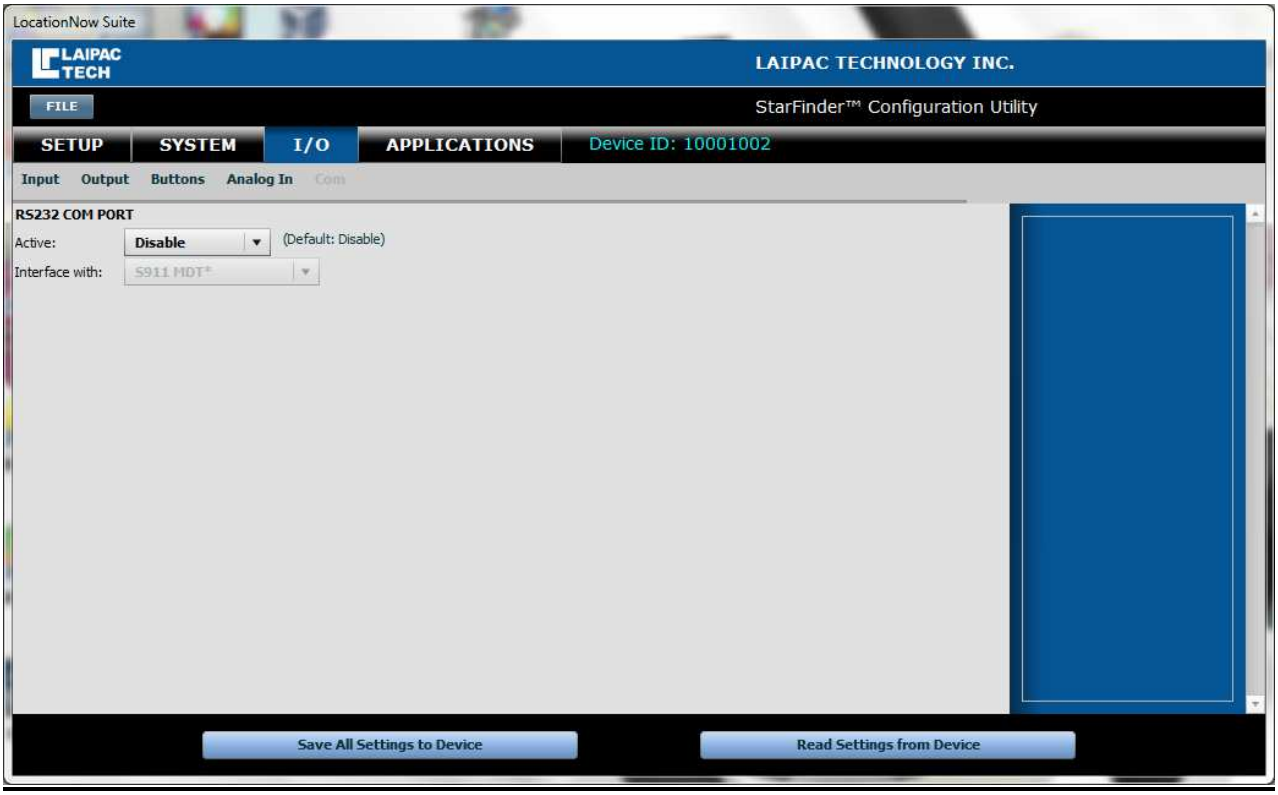
• Alert Low – if input voltage value is lower than Low Level setting, device will send out a alert report to server to remind of server an Alert Low event occurs

• Alert High/Low – if input voltage is either higher than High Level or lower than Low Level setting, device will send out alert report to server

I/O → Com

RS232 COM PORT: Reserved by Laipac and not opened to customer yet



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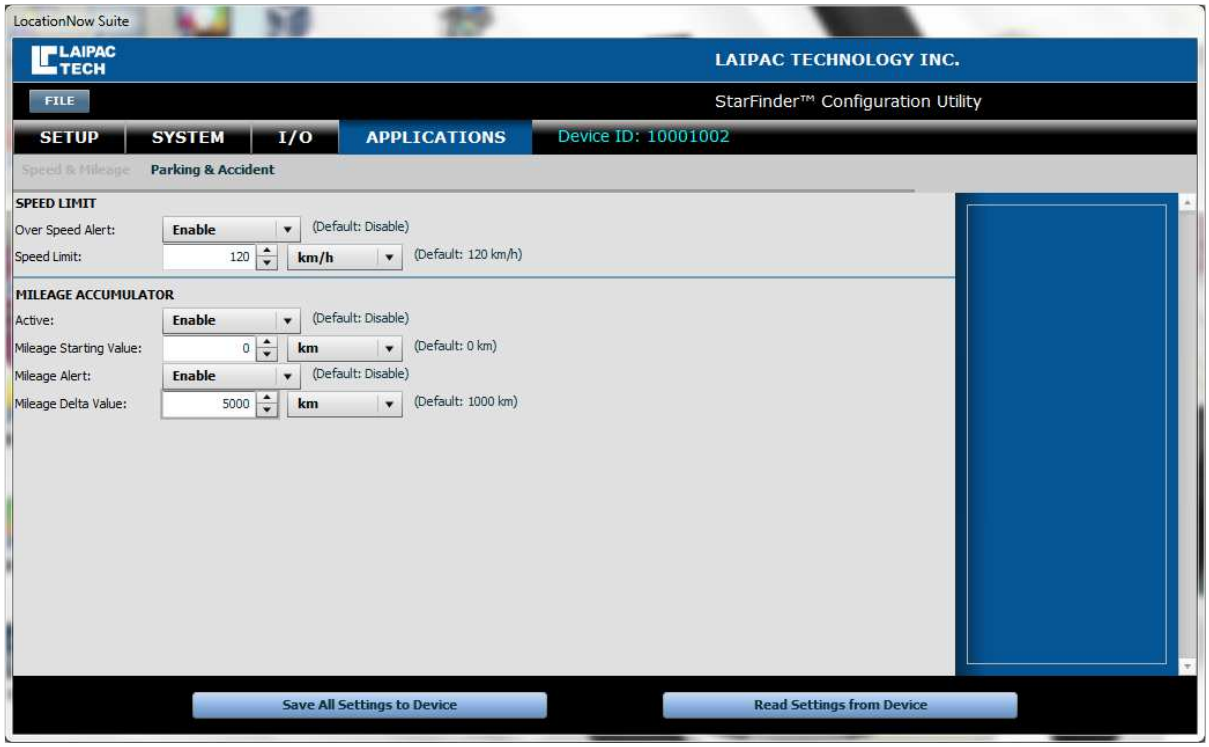
4.4 Application Settings

Application → Speed & Mileage



Over Speed Alert: In order to use this function, it must be enabled first. The Over Speed Alert, formerly known as over-speed, is designed to send an alert if the unit moves faster then the specified speed limit value.

Speed Limit: The speed limit is user defined and can be set in kilometers or miles per hour. If the unit travels faster than this value, an Over Speed Alert will be sent to the GPRS server.

Mileage Accumulator: This function must be enabled before it can be used. Unit is able to accumulate distance based on a user defined "Mileage Starting Value" and the unit of distance during unit moves. Whenever moving distance is increased by 1(km/mile), the incremented value will be added to the Accumulator's current mileage value.

Starting Value: The Mileage Start Value is user defined and is recommended to match the odometer reading in the equipped vehicle. From there you can specify the unit of distance being kilometers or miles and the mileage value will accumulate from there.

Mileage Alert: This alert must be enabled before it can be used. This alert will be sent to the remote server whenever another new Mileage Delta value is reached during vehicle running. It is used to generate a warning for vehicle maintenance warning or oil change, etc is coming due. For example, if Mileage Start Value is 0 km and Mileage Delta Value is 5000km, unit will generate Mileage Alerts when Mileage Accumulator has its reading at 5000 km.

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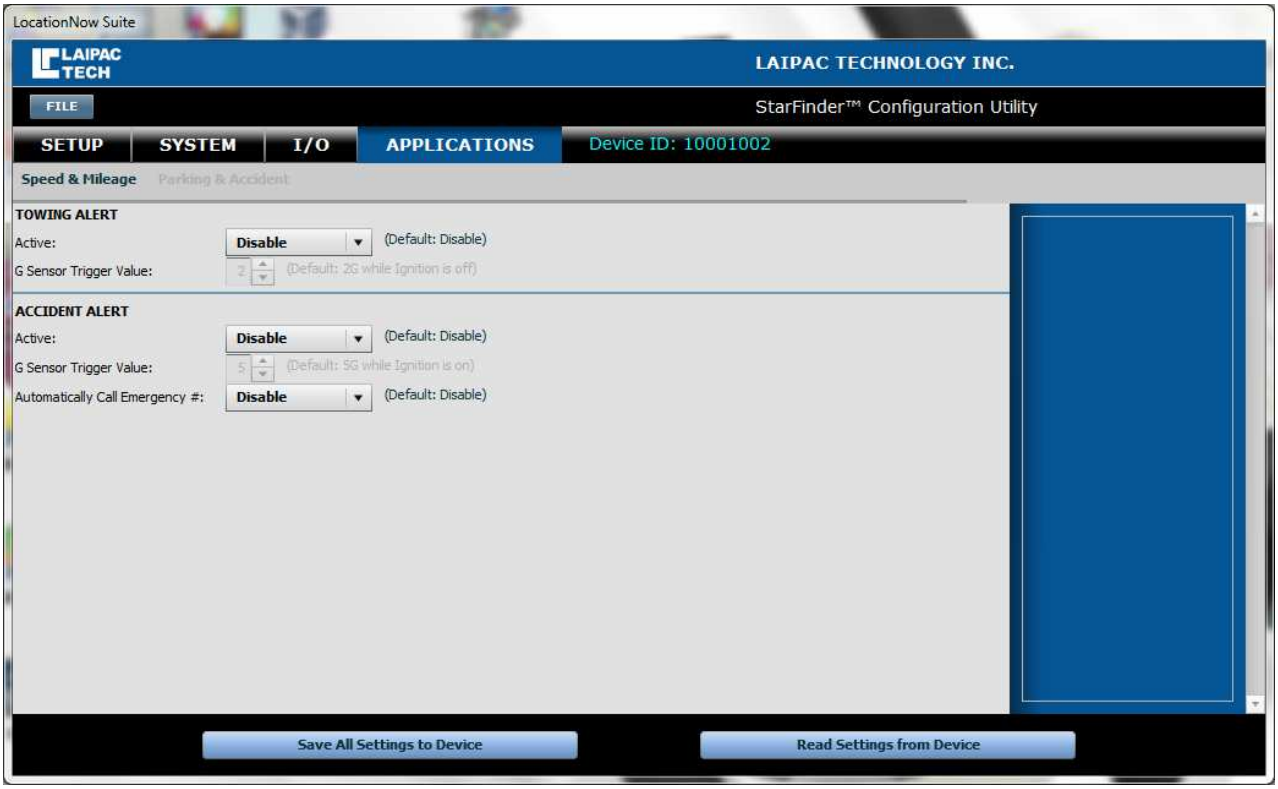
Mileage Delta Value: This value is a user defined distance value. It is designed to provide a warning related to the next vehicle maintenance or oil change job is due. The unit of distance must be the same as the 'Mileage Starting Value'. The default setting for this value is 1000 km

Application → Park & Accident



Towing Alert: The Towing Alert must be enabled before it can be used. This feature requests 'Input 1'to be enabled as "ignition". When vehicle with the unit shuts down its engine, if unit experiences a movement that generates 2G or greater force, the unit will send an alert to the remote server. This may be in a situation where someone tows a vehicle without consent.

Trigger Value: The G Sensor Trigger Value has a default value of 2Gs and should be kept at a low recommended value to sense movement.

Accident Alert: The accident alert requires enabling before it is used. It is designed to sense a high impact hit and send an alert upon receiving it similar to that of a vehicle collision. In order to have this alert working properly, 'Input 1' must be enabled as "ignition", also, user should provide requested "ignition on/off" signal on Input 1. See section **4.3 I/O – Note.**

Trigger Value: The G Sensor Trigger Value has a default value of 5Gs and should be kept as a recommended value to sense a vehicle collision as opposed to a pot hole

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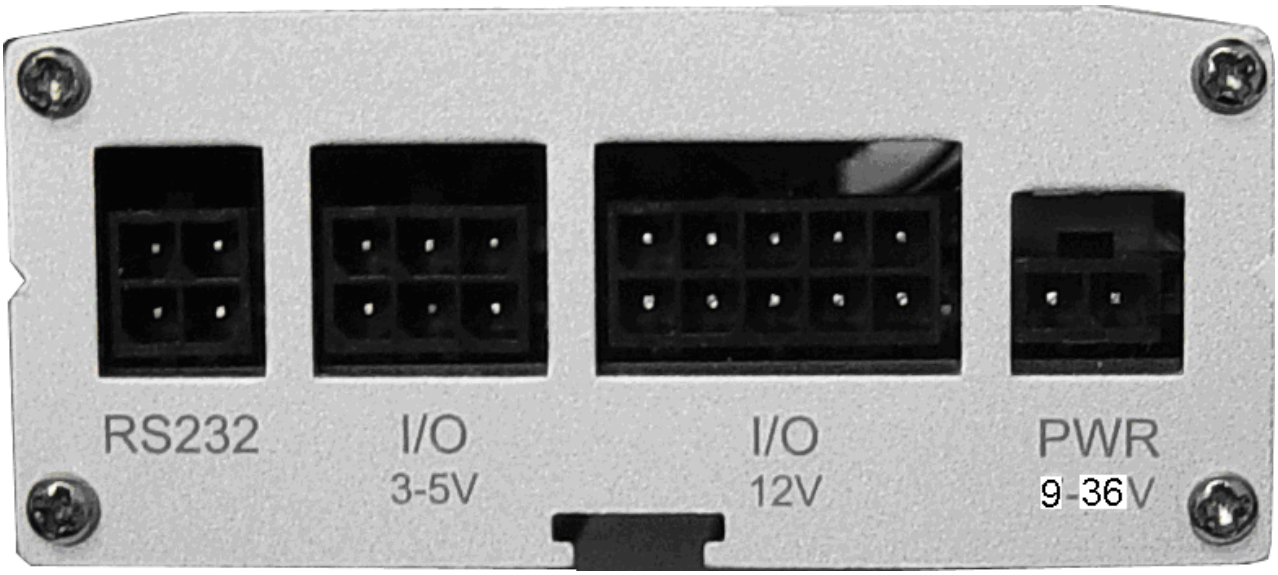
5 HARDWARE DETAILS & INSTALLATION

The Starfinder Lite is enclosed in a robust metal case and can withstand intensive shock and temperature environments. The features on the front of the unit include a SIM card tray, a USB port, the reset button, speaker and microphone jacks, 2 female SMA connectors for the GPS and GSM antennas, and three LEDs to show the status of reporting and connectivity as shown in the below image.

The connections available on the back of the unit include two optically isolated inputs and three Relay outputs in the main I/O section labeled as 12V, one analog input and the TTL I/O ports used for the call answer button labeled as 3-5V, a wide power supply input range of 9-36V, and RS232 interface as shown in the below image. **Note: Please refer to sections 5.1.5 through 5.1.9 for detailed electrical specifications.**



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5.1 Specification

5.1.1 GPS Engine Specifications

	Value	*Units*
Channels	20	Channels
RF Frequency	1575.42	MHz
Position update rate	1	Hz
Active antenna bias voltage	3	V
Position accuracy	< 10	Meters
Velocity accuracy	0.1	m/s
Time accuracy	1	uS
Cold start acquisition time	42	Seconds
Warm start acquisition time	38	Seconds
Hot start acquisition time	1	Seconds
Maximum velocity tracked	515	m/s
Maximum altitude tracked	18,000	Meters
Jerk	20	m/s^3
Tracking Sensitivity	-159	dBm
Navigation Sensitivity	-159	dBm

5.1.2 GSM Modem Specifications

- Quad-band GSM/GPRS component (850/900/1800/1900 MHz)
- Designed for M2M and automotive applications
- Class 4 (2W @ 850 / 900 MHz)
- Class 1 (1W @ 1800 / 1900 MHz)
- R&TTE, GCF, FCC, PTCRB, IC
- Embedded TCP/IP stack.
- GPRS Class 10

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5.1.3 GPS Antenna Specifications

Frequency	1575.42 +/- 3 MHz
VSWR	2.0 Max
Bandwidth	10 MHz Min
Axial Ratio	3dB Typical
Impedance	50 Ohm
Peak Gain	4 dBic Min
Gain Coverage	≥ -4dBic at 90° ≤ 0 ≤ 90° (over 75% volume)
Polarization	RHCP
DC Voltage	3.3V

5.1.4 GSM Antenna Specifications

Bands	850/900/1800/1900 MHz
Frequency Range	824~960 MHz // 1710~1990 MHz
Impedance	50 Ohm
VSWR	<2.0
Gain	2dBi
Radiation	Omni
Polarization	Vertical
Wave	Half Wave Dipole

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5.2 Installation

The difficulty level of installing your Starfinder Lite depends on which features you would like to use. Outlined here will be the basic installation requirements for real-time tracking. You can refer to the Optically Isolated Inputs, Outputs with relays, and Analog Port sections for more advanced hardware features which may require a more intricate installation.

5.2.1 Required Hardware

- Starfinder Lite
- Power, I/O harness, and call button cables
- GSM patch antenna (3 meters long)
- GPS magnet mount antenna (5 meters long)
- GPRS enabled SIM card with known APN settings*

5.2.2 Installing your Starfinder Lite

To begin the installation, insert your activated SIM card into the SIM card tray. Connect the GSM patch antenna (long and skinny) and GPS magnet antenna (square) to the appropriate connectors. To power the unit, connect the power wiring harness and connect the red and black wires to a 9-36V DC supply. Make sure the supplied fuse is in place.

5.2.3 Considerations

There are a few considerations you should make when installing your Starfinder Lite. You should make sure the unit is somewhat accessible so that you can connect the unit to a laptop via USB for configuration and local NMEA-0183 output. The GSM antenna may be mounted almost anywhere, as the GSM signal is generally very strong. The GPS antenna, however, should be mounted somewhere with a clear line of sight to the sky under dash board, or at least in a position not surrounded by metal. If you are having trouble receiving either signal, try relocating the antenna.
Another consideration is, if user wants to get high quality Audio performance, please keep distance SF_Lite unit with electromagnetic noise source.

5.2.4 Other Options

The Starfinder Lite comes with many other options which may need installation. There are 2 optically isolated inputs, 3 Relay outputs, and 1 analog port which may need to be connected and would rely on the specific application for installation details. A certified car audio/security installer should be familiar with connecting the relays to door locks or starter triggers. The specs and considerations for these other features can be found later in this section.

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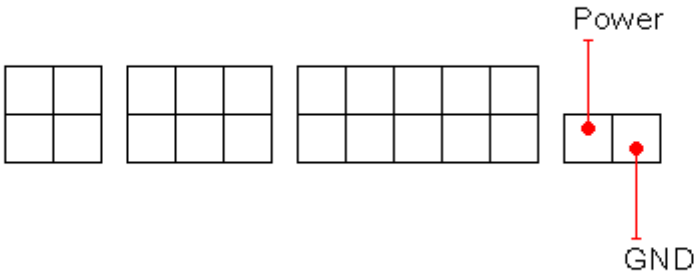
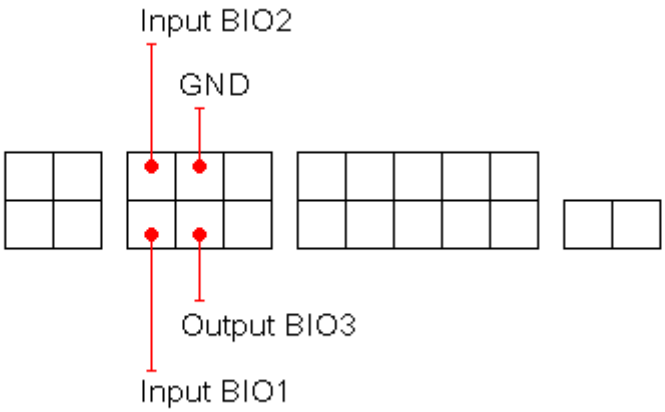
5.2.5 Power Connector



The main Power supply voltage could work in the range of 9-36V. Typical power consumption of the Starfinder Lite is 1W with peaks up to 5.5W. *The current drawn is a result of power over voltage, thus a low voltage power supply will need to provide more current.*

5.2.6 Buttons Input/Output



These four connections are used by the StarFinder Lite Button/Analog cable set. If you are using these without the standard cable set, the following summarizes the use of these connections.

Input BIO1 – Active LOW; will start, answer, or end a phone call (if enabled)
Input BIO2 – Active LOW; will send a Panic report to LocationNow (if enabled)
Output BIO3 – Normally LOW; indicates phone call status (used to drive LED)
GND – Common Ground

The inputs are standard 3.3V to signal a logical HIGH, and tolerant up to 5V; exceeding 5V can damage your StarFinder Lite.

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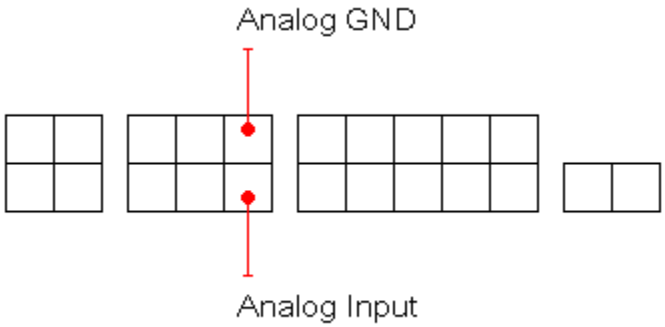
5.2.7 Analog Input

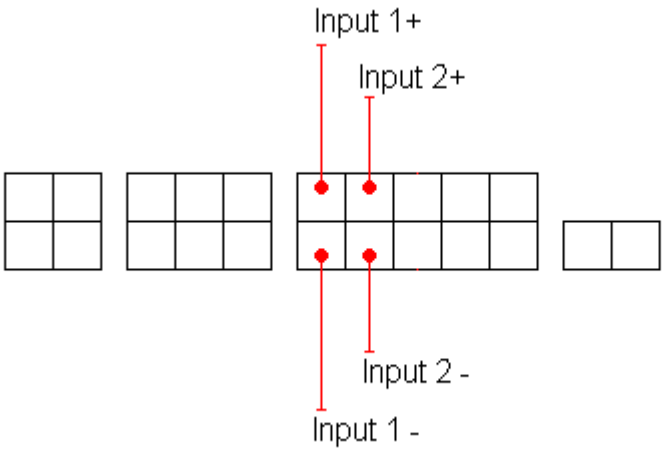


Input voltage	0-3.3V
Resolution	10 bit
Sample Time	100ms

Analog Input – When enabled, the analog port is used to measure input voltage from 0-3.3V and will send an alert when the voltage exceeds the level specified in your configuration. The Analog input is tolerant up to 5V; exceeding 5V can damage your StarFinder Lite.

Analog GND – This is the ground reference for the Analog Input signal.

5.2.8 Optically Isolated Inputs



The positive wires are the sensing wires or wires that detect the voltage changes and the negative wires are for common ground. The positive wires are most commonly connected to solenoid wires that drive ignition, horn, air conditioning, gas cap, door open/closed status, etc.

When the inputs are enabled, they will send an alert when the specified condition is met, and all have the same electrical characteristics and behavioural options.

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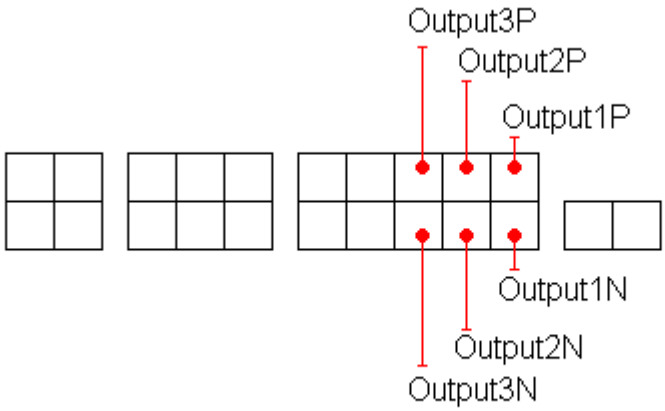
Electrical/Logic Levels Characteristics

	Minimum		Maximum	
	Voltage	Amperage	Voltage	Amperage
Logical HIGH	3.5V	1.3mA	18V	6.7mA
Logical LOW	0V	0mA	1.5V	1.1mA

Note: An input level exceeding 19V could damage the StarFinder Lite and should be avoided.

5.2.9 Three Relay Outputs



The Starfinder Lite has three relay outputs which can be remotely controlled by the control center. All three outputs have the same electrical characteristics and behavioral options. **The outputs serve as a switch** either to drive an external relay or to open/close an existing low amperage circuit. Follow the electrical characteristics chart below or damage may be incurred to both unit and vehicle. Also review page 30 for the output behavior.

Electrical Characteristics

Maximum Allowable Voltage	Maximum Allowable Current
AC 125 V	0.5A
DC 60 V	0.3A
DC 30 V	1A

The switch status of internal Relay when its correspondent output is disabled

Relay 1 --- normally opened;
Relay 2 --- normally opened;
Relay 3 --- normally opened;

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6 OPERATION

The following outlines the various operating and reporting features of the Starfinder Lite.

6.1 LED Operation

Three LEDs are on the front of the unit. They are used to indicate the working status of power supply , GPS, and GSM. The following is a description of their operation.

LED	Off	Fast Flashing	Slow Flashing	Keeping On
Power (Red)	External power not available			External power available
GPS (Green)		GPS Searching for Position		GPS fixed
GSM (Yellow)		Searching for GSM network	GSM network connected	

6.2 Position Reporting by Event

There are many events which can trigger the Starfinder-Lite to send a position report. Most of them are outlined below. For other possible messages, contact sales@laipac.com to purchase the development protocol. The descriptions in *italics* are options and not standard features.

- **Input 1 (Opto 1)** An electrical current signal exerted on Input 1 port will send a position message to the control center with the corresponding event code.
- **Input 2 (Opto 2)** An electrical current signal exerted on Input 2 will send a position message to the control center with the corresponding event code.
- **Geo-Fence** Once the hardware Geo-Fence is set, the Starfinder will report back to the control center when the unit has travelled in/out the boundary with the corresponding event code.
- **Over speed** When the Starfinder travels above the set speed limit it will report back to the control center with the appropriate event code.
- **Timed Reporting** When the time interval reporting is set the Starfinder will send a position message to the control center after this amount of time.
- **Distance Reporting** When the distance interval is set the Starfinder will send a position message to the control center after it has travelled this set distance.
- **Accident Alert** When detected that a high acceleration (configurable level) is achieved the Starfinder Lite will send a report to the SMS base station or control center.
- **Towing Alert** With the towing alert enabled and the vehicle ignition is off when the unit senses movement, an alert message will be sent.

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- **DL Memory Full** Data Logger Memory Full alert will cause the unit to send an alert when the internal memory of the unit is full or has reached max capacity.
- **Mileage Alert** Mileage alert will cause the unit to send an alert when travel distance reaches the value specified by user.

***** *When both time and distance intervals are set they work dynamically together like an 'OR' operation. This means that whenever either condition is met, it will report.*

***** *For detail above refer to section 4.*

6.3 Reporting by Request

In addition to automatically reporting the position you can manually request the current position or settings. The following are some parameters which can be requested.

- System information such as firmware version and memory size
- Current position
- Current mileage or speed limit setting
- Current Report settings
- Current Geo-Fence settings
- Current log settings
- Current input status
- Current output status

6.4 Serial Port

It is reserved now. If user wants to have other external device to interface to this port, please check with Laipac Technology Inc.

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6.5 Function and its configuration method

This table lists the different functions that the Starfinder Lite offers and outlines where they can be configured in reference to the configuration utility, remotely using our protocol, or with our LBS www.locationnow.com platform.

Feature	Location Now	Remote Config	Utility
Device ID	No	Yes	Yes
Device Password	No	Yes	Yes
GSM Band	No	No	Yes
SIM Pin Number	No	No	Yes
Time Zone	No	No	Yes
GPRS Mode	No	Yes	Yes
SMS Mode	No	Yes	Yes
Voice	No	No	Enabled
Incoming call	No	No	Yes
GPRS to SMS fall back	No	No	Yes
APN			
APN username	No	Yes	Yes
APN Password	No	Yes	Yes
Domain name 1a	No	No	Yes
Port 1a	No	Yes	Yes
Static IP 1	No	Yes	Yes
Port 1	No	No	Yes
Domain name 2a	No	No	Yes
Port 2a	No	No	Yes
Static IP 2	No	No	Yes
Port 2	No	No	Yes
DNS IP 1	No	Yes	Yes
DNS IP 2	No	Yes	Yes
Report by time	Yes	Yes	Yes
Report by distance	Yes	Yes	Yes
Smart Log	No	No	Enabled
Air time green mode	No	No	Yes
Waypoints & Events Log			
Log by Time Interval	No	Yes	Yes
Log by Distance Interval	No	Yes	Yes
Data Logger Memory Full Alert	No	No	Yes
Assistance Number	Yes	Yes	Yes
Emergency Number 1	Yes	Yes	Yes
Emergency Number 2	Reserved	Reserved	Reserved

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SMS Base Station Number	No	Yes	Yes
Server Query Selection	No	No	Yes
Server Query Interval	No	Yes	Yes
Input 1 as	No	No	Yes
Alert when Ignition on-off	No	No	Yes
Counter 1 Starting Value	No	No	Yes
Alert when Counter 1 Reaches	No	No	Yes
Input 2 as	No	No	Yes
Alert when Door open-close	No	No	Yes
Counter 2 Starting Value	No	No	Yes
Alert when Counter 2 Reaches	No	No	Yes
Output 1 as	No	No	Yes
Starter Control on-off	No	No	Yes
Timer Control 1 Value	No	No	Yes
Output 2 as	No	No	Yes
Horn Control on-off	No	No	Yes
Timer Control 2 Value	No	No	Yes
Output 3 as	No	No	Yes
Siren Control on-off	No	No	Yes
Timer Control 3 Value	No	No	Yes
Panic Button			
Panic Alert with Following Action	Enabled	Enabled	Enabled
Call Button			
Call Function – pick up the phone	Enabled	Enabled	Enabled
Analog Input	No	No	Yes
Alert when Analog Input Reaches	No	No	Yes
RS232 COM Port	Reserved	Reserved	Reserved
Interface With	Reserved	Reserved	Reserved
Speed Limit Alert	No	No	Yes
Speed Limit	Yes	Yes	Yes
Mileage Accumulator	No	No	Yes
Mileage Starting Value	Yes	Yes	Yes
Mileage Alert for Maintenance	No	No	Yes
Mileage Delta Value	No	No	Yes
Towing Alert	No	No	Yes
Towing G-Sensor Trigger Value	No	No	Yes
Accident Alert	Yes	Yes	Yes
Accident G-Sensor Trigger Value	Yes	Yes	Yes
Geo-fence Setup	Yes	Yes	No
Switch Relay 1	Yes	Yes	No
Switch Relay 2	Yes	Yes	No

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Switch Relay 3	Yes	Yes	No
Request Real Time Position	Yes	Yes	No
Request Device Data	Yes	Yes	No
Request Current Status	Yes	Yes	No
Disable G-sensor	Yes	Yes	No
Disable Geo-fence	Yes	Yes	No

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